

NOTES ON THE NATURALIZATION OF TWO SPECIES OF
EUROPEAN BYRRHIDAE (COLEOPTERA) IN
NORTH AMERICA

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Abstract.—The North American distributions and adventive nature of *Simplocaria semistriata* (F.) and *Chaetophora spinosa* (Rossi) are reviewed. Previous inferences regarding their status as European immigrants is supported, within the context of C. H. Lindroth's criteria for identification of non-native organisms. Notes on the host mosses, life history, and habitats of both species are provided.

During studies on the systematics and ecology of the Byrrhidae, it became apparent that two North American species appeared to be adventive. Although these species, *Simplocaria semistriata* (F.) and *Chaetophora spinosa* (Rossi), have been recorded from North America, and numerous and widely disseminated specimens occur in various collections, there has been little recognition of their immigrant status. Except for Leng (1917) and Lindroth (1957), reports of their immigration into North America are lacking, and no documentation of their extended geographic distribution is available. Therefore, it is my intent here to further evidence and support the immigrant status of both species, as proposed by Leng and Lindroth.

Simplocaria semistriata (F.)

Simplocaria is primarily a Palearctic genus with most of the species occurring in central and southeastern Europe. The *metallica*-group of species is native from Europe through the high latitudes of eastern Asia, and northern and montane North America. The *semistriata*-group is apparently restricted to mid-latitude low-montane and low-land environments through Europe to eastern Asia, with *S. semistriata* seeming to be the most recognized and widespread (e.g., Johnson, 1966; Paulus, 1979). Paulus treated the taxonomy of the central European species, but the genus as a whole requires review. *Simplocaria semistriata* is the only member of the *semistriata*-group recorded in North America.

While studying trans-Atlantic biotic distributions, Lindroth (1957) suggested that *S. semistriata* may have been introduced into North America, and noted its occurrence in Newfoundland as synanthropic. He based his conclusion on the previously unknown existence of this species in North America; its general abundance and

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distribution in northern Europe, including port areas; its ground-dwelling habits; and the similarity of its North American occurrence to that of a wide variety of other immigrant invertebrates and plants.

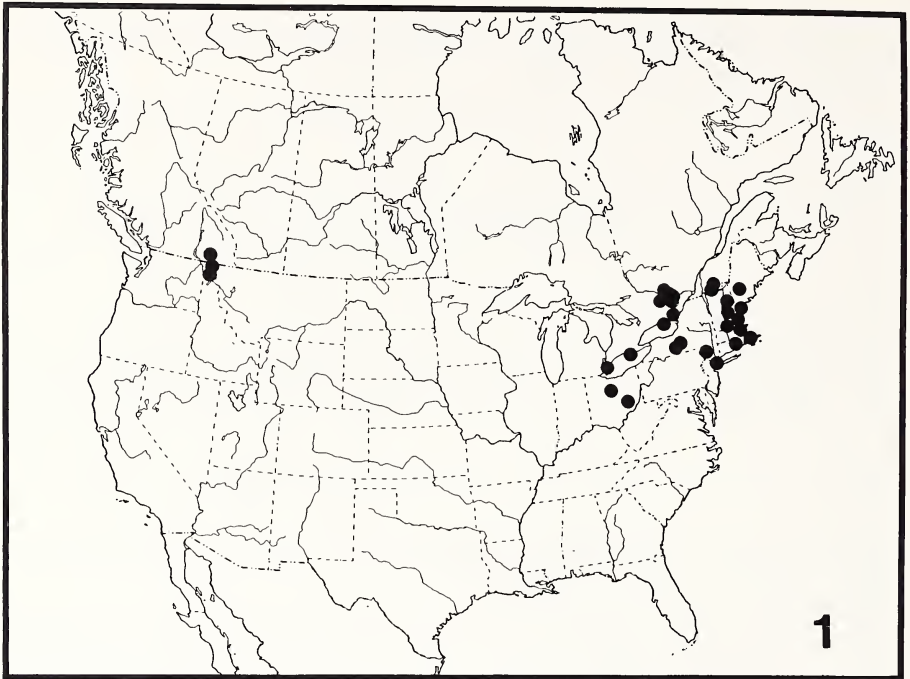
Newfoundland specimens collected by Lindroth and in the collections of the Museum of Comparative Zoology, Cambridge, and the Canadian National Collection, Ottawa, have been examined and were found to be correctly determined by Lindroth. More recently collected Newfoundland specimens have been seen from the collections of Memorial University of Newfoundland and Canadian National Collection. Although North American specimens in the U.S. National Museum collection date from 1913, the species had not been treated as a member of the North American fauna before Lindroth's study.

In autumn 1983, a large series of the beetle was collected by the author at Walden Pond State Park and other nearby sites in Concord, Middlesex County, Massachusetts. At these sites, numerous adults were observed feeding, mating, and ovipositing on mats of the abundant pioneer moss *Dicranella heteromalla* (Hedw.) Schimp. *Atrichum angustatum* (Brid.) BSG was frequently mixed with *D. heteromalla*, but feeding on this moss by either adults or larvae was never observed in the field or laboratory. These mosses were found amongst scattered, weedy herbs on otherwise barren soil at trail margins and between the large exposed roots of living *Quercus rubra* L. and *Acer saccharum* Marsh.

In Scotland, *S. semistriata* has been observed feeding on the moss *Mnium hornum* Hedw. (R. Crowson, *in litt.*). Mosses of the genus *Mnium* are typically found on perennially moister microsites than are *D. heteromalla* and *A. angustatum*, and are abundant throughout North America.

Sexually active adults of *S. semistriata* were present in early October, and the population remained active until severe frosts. Specimens collected in late autumn or winter failed to mate or oviposit, but did feed. Extensively abraded, perambulating and feeding specimens were found on warmer (air temp. $>3^{\circ}\text{C}$) days in February and April on sunlit and snow-free moss patches. A late-second instar larva was found within a mat of *D. heteromalla* in mid-April. Live adults were not found during late spring and summer. It appears that overwintering is accomplished by the first instar larva and senescing adults.

Records for this species are provided here and summarized in Map 1. These localities, except from Newfoundland, represent previously unpublished State or Province records: *CANADA*: BRITISH COLUMBIA—Burnaby Mt.; NEWFOUNDLAND—Cow Head; Avalon Peninsula, Portugal Cove; Cochrane Pond Park; Petty Hn.; Catalina T.B.; St. John's; Long Pond; NOVA SCOTIA—Truro; Cow Bay; ONTARIO—Waterloo; QUEBEC—Ile d'Anticosti, Pointe Nord; 15 km E Lachute; Lucerne; Parc Gatineau; Drummondville; Ste-Clothilde. *UNITED STATES*: CONNECTICUT—Bolton; MAINE—Houlton; MARYLAND—Prince Georges Co., Anacostia River flood; MASSACHUSETTS—Barnstable Co., Nauset Marsh; Middlesex Co., Concord, Walden Pond State Park, Haggood Wright Forest; MINNESOTA—St. Paul; NEW HAMPSHIRE—Rockingham Co., Odiorne Point St. Pk; Strafford Co., 4 mi SW Durham; Durham; Somersworth; NEW YORK—New York; Fishkill; Cayuga Co., Ledyard; Ithaca, Warren farm; Lister Co., Stoneridge; Staten Island, Grant City; OHIO—Harrison Co., 2 km N Flushing; VERMONT—Bennington Co., Big Equinox Mtn.



Map 1. Known distribution of *Simplocaria semistriata* (F.) in the United States and southern Canada.

Chaetophora spinosa (Rossi)

Chaetophora spinosa, formerly in *Syncalypta* (Johnson, 1978), seems to be a relatively well known syncalyptine byrrhid occurring throughout much of Europe. The genus, in a broad sense, seems most diverse in tropical lowland, monsoonal environments in Southeast Asia, Central and South America, and western Africa. Except for *C. spinosa*, *Chaetophora* taxonomy has never been adequately reviewed, and numerous specimens representing undescribed species have been examined. *C. spinosa* is the only species of the genus known to occur in Europe and North America, with previous supposed congeners now assigned to *Curimopsis*.

The first North American records of this species were provided by Leng (1917) from Batavia, New York, and Suffield, Connecticut. At that time, Leng commented on its probable introduced status; he later listed the species as such (Leng, 1920) and gave its distribution as Europe, North America, New York, and Connecticut. Leng (1928) reported the species from the New York localities of Rochester, Batavia, McLean, Genesee Co., and Windsor. Otherwise, this species has not been accurately reported in North America. Additional records are presented below.

One reason *C. spinosa* has not been recognized as an immigrant may be confusion existing between species of *Syncalypta* and *Simplocaria*. For example, Arnett (1973, and earlier editions) incorrectly cited this species as "*Syncalypta tessellata* [sic] (LeConte, 1850), throughout Canada, Connecticut, and New York." This is an un-



Map 2. Known distribution of *Chaetophora spinosa* (Rossi) in the United States and southern Canada.

fortunate confusion with *Simplocaria tessellata* (LeConte), and by including Connecticut and New York in the distribution he may have been confounding this species with *S. semistriata*. This mistake has been perpetuated in research and reference collections I have visited, where North American specimens of both *C. spinosa* and *S. semistriata* have been determined as *Simplocaria* or *Syncalypta* "tessellata."

Chaetophora spinosa occurs primarily in disturbed, moist habitats, with silty topsoils or exposures. Most frequently, these sites are anthropogenic. The habitats I have examined typically contain large expanses of moss protonemata and algae, which appear to constitute the primary hosts. On banks of the Kootenai River and railway and highway embankments in northern Idaho, large populations of this beetle were associated with the mosses *Pohlia atropurpurea* (Wahl.) H. Lind., *Dicranella varia* (Hedw.) Schimp., and *Aloina brevisrostris* (Hook. & Grev.) Kind., although only the former two, with a *Nostoc* sp. of alga, have been confirmed as hosts. The Kootenai River site is characterized by cement rip-rap overlain by riverine silt, while the other sites are embankments cut into deep glacial clay-silts. Elsewhere, other gross habitat associations include unpaved roadways, gardens, and agricultural fields. Specimens have also been collected in-flight from late afternoon through dusk.

North American localities for *C. spinosa* include the following (excluding Leng's records), and are summarized on Map 2; all are previously unpublished State or Province records: CANADA: BRITISH COLUMBIA—Creston; ONTARIO—Brit-

vania; Prince Edward Co., Brimley; Eastview; Pt. Pelee; Ottawa; Long Point; Jordan; Mer Bleue; Arnprior; Kinburn; QUEBEC—Hanefield; Aylmer; Hull; Knowlton; Gatineau Pk., Ramsey Lk.; 4 mi W Masham; Brome; Cascapedia; Duchesnay; Magog. UNITED STATES: CONNECTICUT—Portland; IDAHO—Bonner Co., 11 mi E Priest River; Boundary Co., Copeland bridge at Kootenai River; MAINE—Paris; Augusta; MASSACHUSETTS—Northboro; Lexington; Tyngsboro; Natick; Framingham; Arlington; Fall River; Nahant; NEW HAMPSHIRE—Plymouth; Rumney; Meriden; Plainfield; Orford Center; Strafford Co., 3 mi SE Dover; Coos Co., Dalton; 1 mi NE Colebrook; Carroll Co., 1 mi N Wanalancet, 2.5 mi NW Wanalancet; NEW YORK—Meadowdale; Cayuga Co., Twn of Ledyard; Tompkins Co., Town of Ulysses; Ithaca, Savage Farm; Ithaca, Taghanic; Penn Yan; Ithaca, Warren Farm; OHIO—Harrison Co., 2 km N Flushing; Crawford Co., Bucyrus.

DISCUSSION

Lindroth (1957) provides the most complete treatment of trans-Atlantic biotic distributions with regard to the introduction of European organisms into North America. This and his subsequent faunal history of Newfoundland (Lindroth, 1963) remain the best original attempts at analyzing the causative circumstances of human-induced biotic introductions into North America. Lindroth defined 5 criteria for evaluating the possible introduced status of an organism. Although Brown (1940) had briefly introduced many of the same aspects, he did not elaborate and document his conclusions as thoroughly as did Lindroth. Larson and Langor (1982) and Morris (1983) have accepted and supported Lindroth's criteria in their studies on adventive Newfoundland insects.

Lindroth's following criteria of introduction seem to be adequately fulfilled for establishing the immigrant status of both *S. semistriata* and *C. spinosa*:

1) Historical—Specimens of both species were not recorded in North America until the 20th century. For *S. semistriata*, the earliest records are from Nova Scotia in 1913; for *C. spinosa*, Leng's 1917 record from New York is the first.

2) Geographical—The bicentric distributions in North America of both *S. semistriata* and *C. spinosa*, and the superposition of early locations with port areas follow the same patterns as those documented by Lindroth (1957) for numerous invertebrates and plants of confirmed introduced status. Lindroth (1963) considered such patterns "unnatural" and to belie climatic or host restriction reasons for the organisms' distribution.

3) Ecological—*S. semistriata* has been collected from ballast and imported nursery products on at least two occasions, in New York City, and St. Paul, Minnesota. Although no records of *C. spinosa* are known from import shipments, the species has been repeatedly collected in urban, suburban and developed rural environments. Both species inhabit cultural steppe, an environmental situation containing numerous introduced insects, as noted recently for Carabidae by Larson and Langor (1982) and Spence and Spence (1988). A semi-synanthropic relationship appears to define such an association.

To this criterion, the community patterns of species may be added. As emphasized by Lindroth (1957, 1963), and more recently by Spence and Spence (1988), the

occurrence of certain suites of carabid beetle species in cultural steppe is repetitious. Even though detailed investigations on the community integrity and habitat correlations for *C. spinosa* and *S. semistriata* are incomplete, the cultural steppe pattern seems evident for these beetles. Habitat restrictions are known through much of the Byrrhidae, including *S. semistriata* and *C. spinosa*.

4) Biological—Lindroth (1957, 1963) discussed host specificity under this criterion. This factor may not apply to *C. spinosa* or *S. semistriata*, as their known hosts, though few, are taxonomically unrelated, and are considered naturally Holarctic (e.g., Ireland, 1982; Crum and Anderson, 1981).

5) Taxonomic—Neither *S. semistriata* nor *C. spinosa* have closely related species in North America. *Simplocaria* is otherwise represented in North America by only two species, *S. tessellata* LeConte and *S. remota* Brown, both members of the *metallica*-group. *Simplocaria semistriata*, of the *semistriata*-group, has close congeners only in Eurasia. Congeners of *C. spinosa* are all tropically distributed. No other *Chaetophora* in the Americas are known from north of Veracruz, Mexico.

Based on the above evidence, it appears that *S. semistriata* and *C. spinosa* have been introduced from northwestern Europe, and probably from Great Britain (see Lindroth, 1957). The ecological impact of these immigrants on the native bryophyte flora and fauna, especially during the earliest seres, is unknown.

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